

WINSTAR Display Co.,Ltd.
華凌光電股份有限公司

Represented by:

first FC components
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SPECIFICATION

CUSTOMER : _____

MODULE NO.: WH2002AR-TFH-JT#

APPROVED BY: (FOR CUSTOMER USE ONLY)	PCB VERSION: DATA:

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2023/12/28		First issue

Winstar Display Co.,

華凌光電股份有限公司

MODLE NO：

RECORDS OF REVISION	DOC. FIRST ISSUE

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Precautions in use of LCD Modules

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.

(3)Don't disassemble the LCM.

(4)Don't operate it above the absolute maximum rating.

(5)Don't drop, bend or twist LCM.

(6)Soldering: only to the I/O terminals.

(7)Storage: please storage in anti-static electricity container and clean environment.

(8) Winstar have the right to change the passive components, including R3,R6 & backlight adjust resistors. (Resistors,capacitors and other passive components will have different appearance and color caused by the different supplier.)

(9)Winstar have the right to change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance...etc, under the premise of not affecting the electrical characteristics and external dimensions, Winstar have the right to modify the version.)

(10) To ensure the stability of the display screen, please apply screen saver after showing 30 mins of fixed display content.

(11)Please heat up a little the tape sticking on the components when removing it; otherwise the components might be damaged.

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General Specification

Item	Dimension	Unit
Number of Characters	20 characters x 2Lines	—
Module dimension	116.0 x 37.0 x 13.9 (MAX)	mm
View area	85.0 x 18.6	mm
Active area	73.5x 11.5	mm
Dot size	0.60 x 0.65	mm
Dot pitch	0.65 x 0.70	mm
Character size	3.20 x 5.55	mm
Character pitch	3.70 x 5.95	mm
LCD type	FSTN Positive Transflective (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)	
Duty	1/16	
View direction	6 o'clock	
Backlight Type	LED, White	
Controller IC	ST7066	
Interface	UART	

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Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Supply Voltage	—	V_{SS}-0.3	—	6.0	V
EEPROM Cell Endurance	—	100K	—	—	E/W
Input Voltage	—	V_{SS}-0.3	—	V_{DD}+0.3	V

***Note: "E/W"means Eease/Write times**

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Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	4.5	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_O	Ta=25℃	4.2	4.35	4.5	V
Input High Voltage	V_{IH}	—	3.5	—	5.0	V
Input Low Voltage	V_{IL}	—	0	—	1.5	V
Supply Current (Module + Backlight) *Note	I_{DD}	V_{DD}=5.0V	—	—	45	mA

***Note : Backlight 100% turn on.**

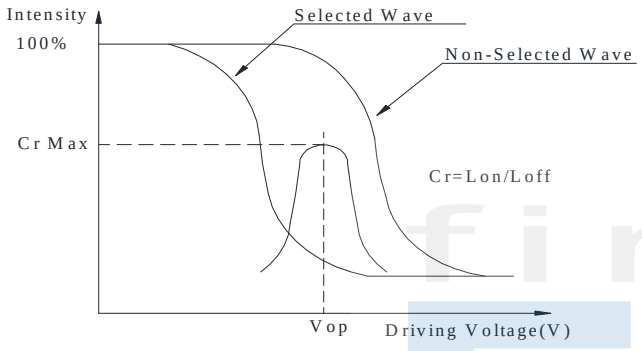
***Software functionally adjusts LCD contrast.**

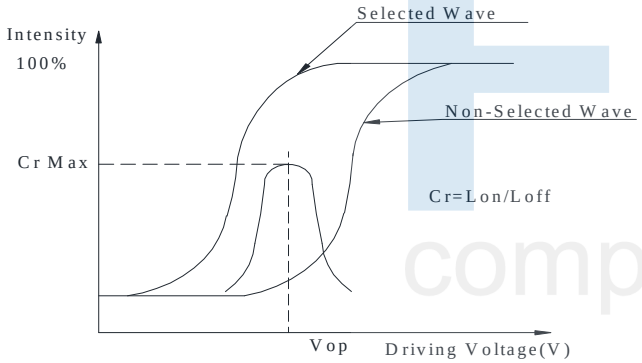
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Optical Characteristics

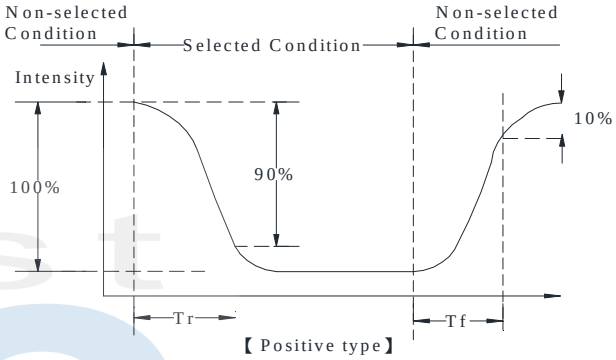
Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	θ	CR≧2	0	—	30	ϕ = 180°
	θ	CR≧2	0	—	60	ϕ = 0°
	θ	CR≧2	0	—	45	ϕ = 90°
	θ	CR≧2	0	—	45	ϕ = 270°
Contrast Ratio	CR	—	—	5	—	—
Response Time	T rise	—	—	150	200	ms
	T fall	—	—	150	200	ms

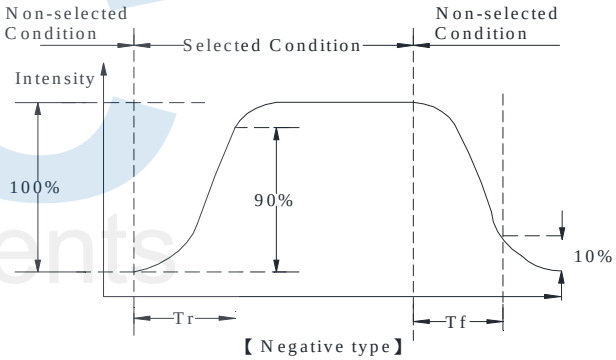
Definition of Operation Voltage (Vop)





Definition of Response Time (Tr , Tf)



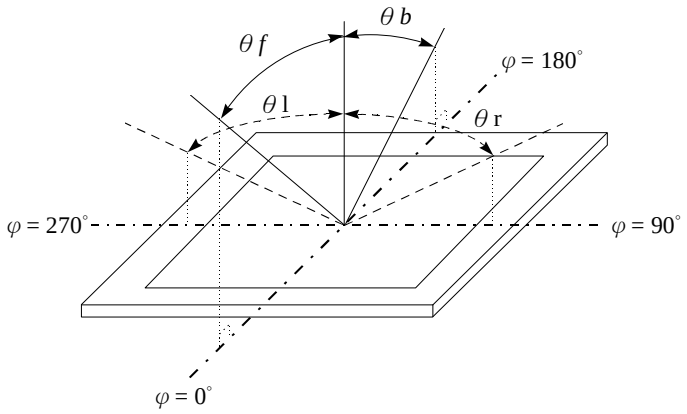


Conditions :

Operating Voltage : Vop　　Viewing Angle(θ ， φ) : 0°， 0°

Frame Frequency : 64 HZ　　Driving Waveform : 1/N duty , 1/a bias

Definition of viewing angle(CR≧2)



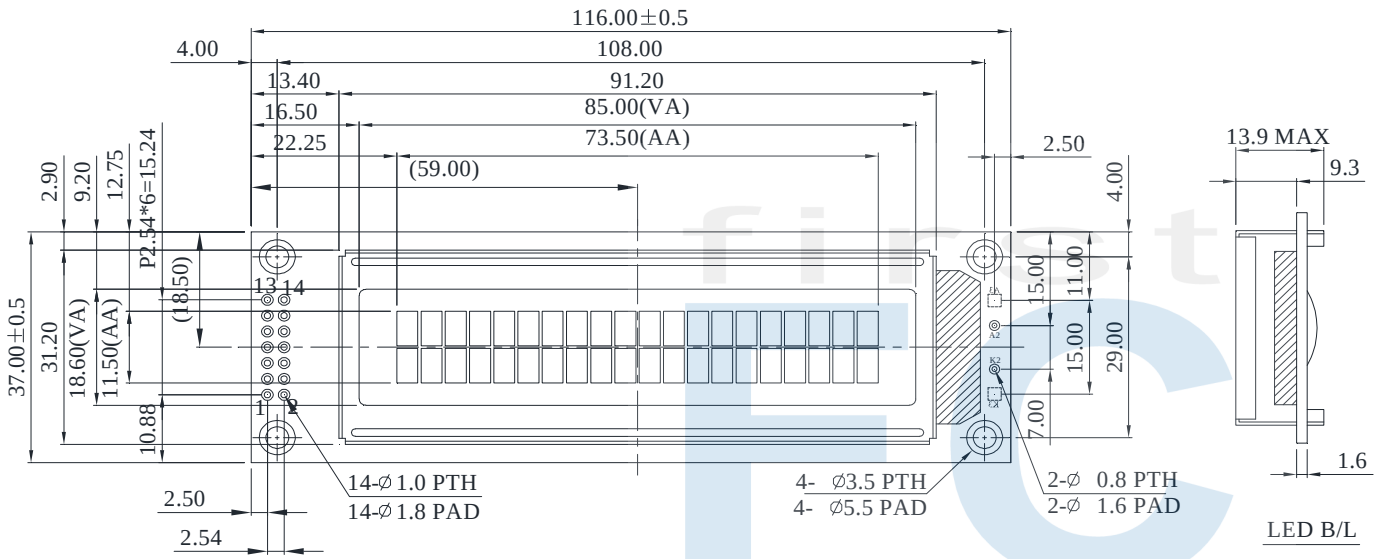
Interface Pin Function

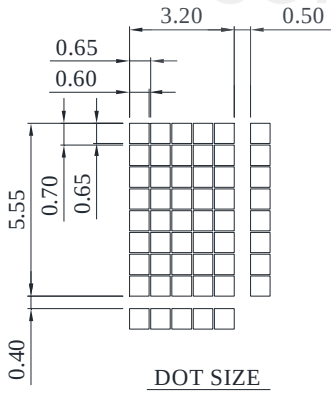
CON1

Pin No.	Symbol	Description
1	RX	UART: serial data input (full duplex communication)
2	VSS	Ground
3	VDD	Supply Voltage
4	TX	UART: serial data output
5	CS	SPI: chip select
6	SDO	SPI: serial data output
7	SCK/SCL	SPI: serial clock I2C: serial clock
8	SDI/SDA	SPI: serial data input I2C: serial data input/output
9	VSS	Ground
10	VDD	Supply Voltage
11-14	NC	No connection

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Contour Drawing





Pin No.	Symbol
1	RX
2	VSS
3	VDD
4	TX
5	CS
6	SDO
7	SCK/SCL
8	SDI/SDA
9	VSS
10	VDD
11	NC
12	NC
13	NC
14	NC

The non-specified tolerance of dimension is ±0.3 mm .

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Instruction List

Prefix	Command	Parameter	Description	Execution Time
-	-	1 Byte	Display Character (0x00 ~ 0xFF without 0xFE)	530us
0xFE	0x41	None	Display On	400us
0xFE	0x42	None	Display Off	400us
0xFE	0x45	1 Byte	Set Cursor Position	400us
0xFE	0x46	None	Cursor Home	1900us
0xFE	0x47	None	Cursor On	400us
0xFE	0x48	None	Cursor Off	400us
0xFE	0x49	None	Cursor Shift Left	400us
0xFE	0x4A	None	Cursor Shift Right	400us
0xFE	0x4B	None	Cursor Blink On	400us
0xFE	0x4C	None	Cursor Blink Off	400us
0xFE	0x4E	None	Backspace	800us
0xFE	0x51	None	Clear Display	2.2ms
0xFE	0x52	1 Byte	Contrast Setting	28ms
0xFE	0x53	1 Byte	Backlight Setting	28ms
0xFE	0x54	9 Byte	Set Custom Character	3ms
0xFE	0x55	None	Shift Display Left	800us
0xFE	0x56	None	Shift Display Right	800us
0xFE	0x61	1 Byte	Change Baud Rate	28ms
0xFE	0x62	1 Byte	Change I2C Address	28ms
0xFE	0x70	None	Display Firmware Version	6.4ms
0xFE	0x71	None	Display Baud Rate	6.8ms
0xFE	0x72	None	Display I2C Address	6.8ms
0xFE	0x73	1 Dummy Byte	Read Data	430us

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